month to a high of $544.61 per month.[81] Thus, the lowest cost CBG is in the highest density category, and conversely, the highest cost CBG is in the lowest density zone. To place this in perspective, the highest cost CBG serves a mere seven households which require (according to the uncorrected BCM) aggregate annual support of $44,068 at the $20 threshold level or over $6,000 of support per household per year. Table 3.5 and Table 3.6 below indicate separately for each of the six density zones the CBGs and the households that would receive USF assistance according to the BCM.

Table 3.5

Percentage of Washington State CBGs Receiving USF Assistance at Different Thresholds as Calculated by the BCM

Density Zone	Number of CBGs	$20 Support Level	$30 Support Level	$40 Support Level
<=5	275	100%	100%	99.3%
5 to 200	1099	75.3%	23.4%	6.9%
200 to 650	642	0.9%	0.0%	0.0%
650 to 850	242	0.0%	0.0%	0.0%
850 to 2550	1548	0.7%	0.0%	0.0%
> 2550	736	0.4%	0.0%	0.0%
TOTAL	4542	24.7%	11.7%	7.7%

81. The low cost one is CBG 530330033005 of the STTLWASU (Seattle) wire center. The high cost one is CBG 530050116002 of the KNWCWAXB wire center.

Table 3.6

Percentage of Washington State Households Receiving USF Assistance at Different Thresholds as Calculated by the BCM

Density Zone	Number of Households	$20 Support Level	$30 Support Level	$40 Support Level
<=5	62645	100%	100%	99.8%
5 to 200	372988	78.2%	21.6%	5.6%
200 to 650	273086	0.7%	0.0%	0.0%
650 to 850	109294	0.0%	0.0%	0.0%
850 to 2550	689169	0.2%	0.0%	0.0%
> 2550	364583	0.1%	0.0%	0.0%
TOTAL	1871765	19.1%	7.6%	4.5%

Our preliminary analysis of the BCM's Washington State data file[82] shows a mean of 412 households per block group. Yet, further analysis shows that the standard deviation of this mean is 269, with a minimum value of one household[83] and the maximum value of 3,489 households per CBG.[84] (Nationwide, 3,608 of 220,000 CBGs have densities of less than 1 household per square mile.[85]) The largest CBG in Washington is approximately 1,300 square miles and includes 35 households.[86] Businesses are not considered households under the census definition, and therefore, particularly in those areas where there is a disproportionate number of businesses, the density of the CBG will be understated,[87]

82. WADTIN_1.XLS.

83. CBG 530050105005, Row 2380 of WADTIN_1.XLS

84. CBG 530530729021, Row 3865 of WADTIN_1.XLS.

85. Joint Submission, at V-1.

86. CBG No. 530599501001; Row 594, WADTIN1.XLS.

87. In their *Ex parte* submission of January 26, 1996, *op. cit.*, footnote 75, the Joint Sponsors indicated that the suggestion to identify CBGs which are primarily business (i.e., low number of households in a small geographic

(continued...)

as will the potential impact of the business demand upon the overall unit cost of serving the CBG and its associated wire center.[88] Therefore, the cost factor multipliers that are related to the density zone assignment may inadvertently be applying "more rural" cost factors than are appropriate. The BCM's results for the state of Washington are shown in Table 3.7.

Table 3.7

Summary Results of the BCM
Washington State

	Annual Cost Factor #1	**Annual Cost Factor #2**
Annual Benchmark Cost	$524,623,612	$380,427,268
Support at $20	$158,350,839	$77,846,835
Support at $30	$97,982,543	$50,692,630
Support at $40	$72,368,201	$37,662,589
Average Monthly Cost	$23.36	$16.94

Source: ETI run of the BCM, without corrections.

87. (...continued)
area) is "desirable but difficult" which the Joint Sponsors further indicate means that the change would enhance the usefulness of the model and that if there is sufficient interest in making the change, they would be willing to attempt to make the modification. In a later ex parte filing, the Joint Sponsors indicate that they plan to identify situations where the CBG area is less than "x" and households are less than "y" and that the model will assume such cases are primarily business. The model will assign a default business line count of 400 for network design counts. See, *Ex parte* submission of February 21, 1996, *op. cit.*, footnote 75. We ranked the Massachusetts CBGs by density and identified several CBGs that might satisfy such a test. For example, in Malden (a city with a population of 53,884 and a land area of 4.8 square miles) there is a CBG of 0.19 square miles with one household (CBG 250173413004); and in Lexington (a town with a population of 28,974 and a land area of 16.64 square miles), there is a CBG of 0.75 square miles, and 6 households. (Bureau of the Census, *1990 Census of Population of a Place*; Malden Chamber of Commerce and Lexington Chamber of Commerce).

88. The presence of business demand will permit the LEC to utilize higher capacity cables and switches that offer lower unit costs. By ignoring business demand, the BCM thus overstates the cost of the residential-only demand that it purports to examine. Ironically, although the salutary effects of business demand upon unit cost are omitted in the model, the BCM relies upon *company-wide* plant utilization factors that are driven *downward* by the very business demand that the model otherwise ignores, thereby compounding its erroneous treatment of business customers. The correct approach, which we employ here, is to limit the model to the specific services at issue (i.e., the primary residential access line) and to utilize the plant utilization factors that are applicable for this specific service. Gains from scale and scope economies resulting from the inclusion of business service and additional residential access lines are identified separately and should inure to *all* service categories.

3.4 A careful analysis of some of the BCM's key variables and assumptions shows that there are certain areas where the BCM should be improved before it is used as a tool

Although the BCM provides a reasonable foundation for a cost proxy model, there are certain assumptions and algorithms that should be corrected before the model is adopted for use in policy making proceedings. The following sections of this chapter analyze and, in many instances, recommend corrections to these key variables:

- Cost factor, i.e., the way to translate total investment into annual carrying costs (the percentage by which to multiply the total investment in order to compute an annual figure to reflect operating expenses and a reasonable return on investment).

- The price threshold, i.e., the monthly price above which the BCM computes USF requirements.

- The cost of the switches.

- Variables that relate to a LEC's economy of scale and scope. These variables include:

  (a) The manner in which the BCM accounts for the existence of business lines.

  (b) The area for which the eligibility for and level of USF support is evaluated.

- The scope of the service for which the model is yielding a cost proxy. The low fill factors used in the BCM suggest that the model fails to distinguish the costs of providing one primary basic residential exchange service access line per household from the costs of additional residential lines and, for that matter, of all other loop-using LEC services. This issue in turn affects the fill factor used.

- The equipment prices and discounts for the SLC and AFC equipment.

- The assumption of uniform distribution of households within a CBG.

- The lack of SAIs.

- Overstatement of incremental costs to CBGs most distant from the central office.

This report does not evaluate each and every critical variable, and thus silence should not necessarily be construed as acquiescence or endorsement. For example, this report has not provided any examination of the costs of fiber and copper cable that are assumed, although such data would clearly influence the BCM results. In this example, and for similar situations, we urge the Joint Board, the FCC, and PUCs to seek back-up support from the Joint Sponsors for the data provided.

Appendix 3A | STATES RANKED BY QUANTITY OF CBGs

Appendix 3A: States Ranked by Quantity of CBGs

RANK	STATES	CBGs
1	California	20923
2	New York	15589
3	Texas	15457
4	Pennsylvania	11688
5	Illinois	10648
6	Ohio	10418
7	Michigan	9521
8	Florida	8849
9	New Jersey	6857
10	North Carolina	5635
11	Massachusetts	5521
12	Indiana	5391
13	Missouri	5077
14	Georgia	5047
15	Wisconsin	4919
16	Virginia	4655
17	**Washington**	**4542**
18	Minnesota	4394
19	Tennessee	4326
20	Louisiana	3960
21	Alabama	3789
22	Oklahoma	3636
23	Maryland	3615
24	Kentucky	3507
25	Colorado	3360
26	Arizona	3315
27	South Carolina	3194
28	Kansas	2928
29	Iowa	2917
30	Connecticut	2879
31	Oregon	2601
32	Mississippi	2379
33	Arkansas	2351
34	Nebraska	1935
35	West Virginia	1795
36	New Mexico	1535
37	Utah	1316
38	Maine	1284
39	Idaho	1111
40	North Dakota	1104
41	Montana	1017
42	New Hampshire	1005
43	South Dakota	978
44	Rhode Island	879
45	Nevada	798
46	Wyoming	733
47	Vermont	593
48	Hawaii	561
49	District of Columbia	545
50	Delaware	519
	TOTAL	221596

Appendix 3B | COST FACTOR TABLE

CostFactorTable					
				Surface	Weighted
Row #	Plant Type	Urban/Rural	Density	Category	Cost Facto
1	Distribution	Urban	>2550	RockH	1.4208
2				RockS	1.088
3				Normal	1.0176
4	Distribution	Urban	850-2550	RockH	1.194
5				RockS	0.924
6				Normal	0.858
7	Distribution	Rural	650-850	RockH	0.709
8				RockS	0.4165
9				Normal	0.2905
10	Distribution	Rural	200-650	RockH	0.702
11				RockS	0.407
12				Normal	0.279
13	Distribution	Rural	5-200	RockH	0.688
14				RockS	0.388
15				Normal	0.256
16	Distribution	Rural	0-5	RockH	0.674
17				RockS	0.369
18				Normal	0.233
19	Feeder	Urban	>2550	RockH	1.9584
20				RockS	1.5616
21				Normal	1.4208
22	Feeder	Urban	850-2550	RockH	1.446
23				RockS	1.146
24				Normal	1.047
25	Feeder	Rural	650-850	RockH	0.688
26				RockS	0.388
27				Normal	0.256
28	Feeder	Rural	200-650	RockH	0.702
29				RockS	0.407
30				Normal	0.279
31	Feeder	Rural	5-200	RockH	0.709
32				RockS	0.4165
33				Normal	0.2905
34	Feeder	Rural	0-5	RockH	0.716
35				RockS	0.426
36				Normal	0.302
37	Fiber	Urban	>2550	RockH	11.5456
38				RockS	9.2416
39				Normal	8.3968
40	Fiber	Urban	850-2550	RockH	8.468
41				RockS	6.748
42				Normal	6.154
43	Fiber	Rural	650-850	RockH	3.25
44				RockS	1.74
45				Normal	1.276
46	Fiber	Rural	200-650	RockH	3.375
47				RockS	1.885
48				Normal	1.404
49	Fiber	Rural	5-200	RockH	3.4375
50				RockS	1.9575
51				Normal	1.468
52	Fiber	Rural	0-5	RockH	3.5
53				RockS	2.03
54				Normal	1.532

Appendix 3C — DENSITY ZONES UTILIZED BY THE BCM

Density Zones Utilized by the BCM

Zone Number	Households Per Square Mile
1	0 - 5
2	5 - 200
3	200 - 650
4	650 - 850
5	850 - 2550
6	> 2550

Note: The definition of density zones is located in the Tables tab of the DATA60~1.XLS file. There is a special cost multiplier of 1.28 for density zone 6.

Appendix 3D | FILL FACTORS AND OUTSIDE PLANT COSTS

USER INPUTS TO MODEL

4200 =Maximum Copper Feeder Cable Size

3600 =Maximum Copper Distribution Cable Size

SLC Cost per Access Line
500

Fill Factors for Electronics

0.8	AFC
0.8	SLC

AFC Cost per Access Line
550

Cable Fill factors

	Feeder	Distribution
0	0.65	0.25
5	0.75	0.35
200	0.8	0.45
650	0.8	0.55
850	0.8	0.65
2550	0.8	0.75

Enter 2 digit whole percentage numbers for the following data:

Fiber Feeder UG/Aerial Mix Table

Density	UG%	Aerial%
0-5	60	40
5-200	65	35
200-650	70	30
650-850	80	20
850-2550	90	10
>2550	100	0

Fiber Cable Discount % (Enter whole % in space belov
20

Copper Cable Discount % (Enter whole % in space be
20

AFC Electronics Discount %
10

Copper Feeder UG/Aerial Mix Table

Density	UG%	Aerial%
0-5	60	40
5-200	65	35
200-650	70	30
650-850	80	20
850-2550	90	10
>2550	100	0

SLC electronics Discount %
20

Copper Distribution Costs

Cable Size	Cost UG	Cost Aerial
3600	22.20	21.90
3000	18.80	18.50
2400	14.30	14.10
1800	12.44	12.24
1200	10.68	10.00
900	7.82	7.51
600	7.13	7.06
400	4.56	4.62
200	2.36	2.33
100	1.262	1.266
50	0.678	0.572

Distribution UG/Aerial Mix Table

Density	UG%	Aerial%
0-5	90	10
5-200	80	20
200-650	70	30
650-850	65	35
850-2550	60	40
>2550	50	50

Fiber Cable Costs

Cable Size	Cost UG	Cost Aerial
144	5.56	5.24
96	3.80	3.53
72	2.84	2.65
60	2.41	2.23
48	1.98	1.84
36	1.60	1.46
24	1.18	1.05
18	0.98	0.85
12	0.79	0.66

Copper Feeder Costs

Cable Size	Cost UG	Cost Aerial
4200	25.70	25.40
3600	22.20	21.90
3000	18.80	18.50
2400	14.30	14.10
1800	12.44	12.24
1200	10.68	10.00
900	7.82	7.51
600	7.13	7.05
400	4.56	4.62
200	2.36	2.33
100	1.262	1.266

Pricing after discount

AFC	495
SLC	400

Appendix 3E

SURFACE TEXTURE TABLE

Surface texture table

Texture	Impact?	Description of Texture
	0	Blank
BY	1	Bouldery
BY-SICL	1	Bouldery & Silty Clay Loam
BYV	1	Very bouldery
BYV-FSL	1	Very Bouldery & Fine Sandy Lo
BYV-L	1	Very bouldery & Loamy
BYV-LS	1	Very Bouldery & Loamy Sand
BYV-SIL	1	Very Bouldery & Silt
BYV-SL	1	Very bouldery & Sandy Loam
BYX	1	Extremely Bouldery
BYX-L	1	Extremely Bouldery & Loamy
BYX-SIL	1	Extremely Bouldery & Silt Loam
C	0	Clay
CB	0	Cobbly
CBA	1	Angular Cobbly
CB-C	0	Cobbly & Clay
CB-CL	0	Cobbly & Clay Loam
CB-COSL	0	Cobbly & Coarse Sandy Loam
CB-L	0	Cobbly & Loamy
CB-LS	0	Cobbly & Loamy Sand
CB-S	0	Cobbly & Sand
CB-SIL	0	Cobbly & Silt Loam
CB-SL	1	Cobbly & Sandy Loam
CBV	1	Very cobbly
CBV-C	1	Very Cobbly & Clay
CBV-CL	1	Very Cobbly & Clay Loam
CBV-L	1	Very cobbly & Loamy
CBV-SIL	1	Very Cobbly & Silt
CBV-SL	1	Very Cobbly & Sandy Loam
CBX	1	Extremely Cobbly
CE	0	Coprogenous Earth
CIND	0	Cinders
CL	0	Clay Loam
CM	1	Cemented
CN	0	Channery
CN-FSL	0	Channery & Fine Sandy Loam
CN-L	0	Channery & Loam
CN-SIL	0	Channery & Silty Loam
CN-SL	0	Channery & Sandy Loam
CNV	0	Very Channery
CNV-L	0	Very Channery & Loam

CNV-SIL	0 Very Channery & Silty Loam
CNV-SL	0 Very Channery & Sandy Loam
CNX	0 Extremely Channery
CNX-SL	0 Extremely Channery & Sandy L
COS	0 Coarse Sand
COSL	0 Coarse Sandy Loam
CR	0 Cherty
CRC	1 Coarse Cherty
CR-L	1 Cherty & Loam
CR-SIL	1 Cherty & Silty Loam
CRV	1 Very Cherty
CRV-L	1 Very Cherty & Loam
CRX	1 Extremely Cherty
DE	0 Diotomaceous Earth
FB	0 Fibric Material
FL	0 Flaggy
FL-L	0 Flaggy & Loam
FL-SICL	0 Flaggy & Silty Clay loam
FL-SIL	0 Flaggy & Silty Loam
FLV	1 Very Flaggy
FLX	1 Extremely Flaggy
FLX-L	1 Extremely Flaggy & Loamy
FRAG	0 Fragmental Material
FS	0 Fine Sand
FSL	0 Fine Sandy Loam
G	0 Gravel
GR	0 Gravelly
GRC	0 Course Gravelly
GR-C	0 Gravel & Clay
GR-CL	0 Gravel & Clay Loam
GR-COS	0 Gravel & Course Sand
GR-COSL	0 Gravel & Coarse Sandy Loam
GRF	0 Fine Gravel
GR-FS	0 Gravel & Fine Sand
GR-FSL	0 Gravel & Fine Sandy Loam
GR-L	0 Gravel & Loam
GR-LCOS	0 Gravel & Loamy Course Sand
GR-LFS	0 Gravel & Loamy Fine sand
GR-LS	0 Gravel & Loamy Sand
GR-S	0 Gravel & Sand
GR-SCL	0 Gravel & Sandy Clay Loam
GR-SIC	0 Gravel & Silty Clay
GR-SIL	0 Gravel & Silty Loam

GR-SL	0 Gravel & Sandy Loam
GRV	1 Very Gravelly
GRV-CL	1 Very gravelly & Clay Loam
GRV-COS	1 Very Gravelly & Course Sand
GRV-COSL	1 Very Gravelly & Course Sandy
GRV-FSL	1 Very Gravelly & Fine Sandy Loc
GRV-L	1 Very Gravelly & Loam
GRV-LCOS	1 Very Gravelly & Loamy Course
GRV-LS	1 Very Gravelly & Loamy Sand
GRV-S	1 Very Gravelly & Sand
GRV-SCL	1 Very Gravelly & Sandy Clay Lo
GRV-SIL	1 Very Gravelly & Silt
GRV-SL	1 Very Gravelly & Sandy Loam
GRX	1 Extremely Gravelly
GRX-COS	1 Extremely Gravelly & Coarse Sc
GRX-L	1 Extremely Gravelly & Loam
GRX-S	1 Extremely Gravelly & Sand
GRX-SL	1 Extremely Gravelly & Sandy Lo
GYP	1 Gypsiferous Material
HM	0 Hemic Material
ICE	1 Ice or Frozen Soil
IND	1 Indurated
L	0 Loam
LCOS	0 Loamy Course Sand
LFS	0 Loamy Fine Sand
LS	0 Loamy Sand
LVFS	0 Loamy Very Fine Sand
MARL	0 Marl
MK	0 Mucky
MK-C	0 Mucky Clay
MK-CL	0 Mucky Clay Loam
MK-FSL	0 Muck & Fine Sandy Loam
MK-L	0 Mucky Loam
MK-SIL	0 Mucky Silt
MK-VFSL	0 Mucky & Very Fine Sandy Loan
MPT	0 Mucky Peat
MUCK	0 Muck
PEAT	0 Peat
PT	0 Peaty
RB	1 Rubbly
S	0 Sand
SC	0 Sandy Clay
SCL	0 Sandy Clay Loam

SG	0 Sand and Gravel
SH	0 Shaly
SH-CL	0 Shaly & Clay
SH-L	0 Shale & Loam
SH-SICL	0 Shaly & Silty Clay loam
SH-SIL	0 Shaly & Silt Loam
SHV	1 Very Shaly
SHV-CL	1 Very Shaly & Clay Loam
SHX	1 Extremely Shaly
SI	0 Silt
SIC	0 Silty Clay
SICL	0 Silty Clay Loam
SIL	0 Silt Loam
SL	0 Sandy loam
SP	0 Sapric Material
SR	0 Stratified
ST	0 Stony
ST-C	0 Stony & Clay
ST-CL	0 Stony & Clay Loam
ST-COSL	0 Stony & Course Sandy Loam
ST-FSL	0 Stony & Fine Sandy Loam
ST-L	0 Stony & Loamy
ST-LCOS	0 Stony & Loamy Course Sand
ST-LFS	0 Stony & Loamy Fine Sand
ST-LS	0 Stony & Loamy Sand
ST-SIL	0 Stony & Silt Loam
ST-SL	0 Stony & Sandy Loam
STV	1 Very Stony
STV-CL	1 Very Stony & Clay Loam
STV-FSL	1 Very Stony & Fine Sandy Loam
STV-L	1 Very Stony & Loamy
STV-MUCK	1 Very Stony & Muck
STV-SICL	1 Very Stony & Silty Clay Loam
STV-SIL	1 Very Stony & Silty Loam
STV-SL	1 Very Stony & Sandy Loam
STX	1 Extremely Stony
STX-C	1 Extremely Stony & Clay
STX-CL	1 Extremely Stony & Clay Loam
STX-L	1 Extremely stony & Loamy
STX-LCOS	1 Extremely Stony & Loamy Cour
STX-SIL	1 Extremely Stony & Silty Loam
STX-SL	1 Extremely stony & Sandy Loam
SY	1 Slaty

SY-SIL	1 Slaty & Silty Loam
SYV	1 Very Slaty
SYX	1 Extremely Slaty
UNK	0 Unknown
UWB	1 Unweathered Bedrock
VAR	0 Variable
VFS	0 Very Fine Sand
VFSL	0 Very Fine Sandy loam
WB	1 Weathered Bedrock

Appendix 3F

DISTRIBUTION OF WASHINGTON STATE POPULATION WITHIN THE BCM's SIX DENSITY ZONES

Distribution of Washington State Population within the BCM's Six Density Zones

Density Zones	Households	Percent of Total
<=5	62645	3.3%
5 to 200	372988	19.9%
200 to 650	273086	14.6%
650 to 850	109294	5.8%
850 to 2550	689169	36.8%
> 2550	364583	19.5%
TOTAL	1871765	100.0%

4 AN ANALYSIS OF THE COST FACTOR AND PRICE THRESHOLD

4.1 The cost factor in a proxy model should not be based upon historical accounting data

What the model does

The BCM computes a monthly per-line cost by multiplying the total investment per line by a factor which is intended to reflect operating expenses (including depreciation) and an after-tax return on investment. The BCM provides two sets of results that reflect two very different cost factors:

(1) A factor of 31.6765% reflecting historical accounting data and total expense levels of Tier 1 LECs based upon 1994 ARMIS Form 43-01; and

(2) A factor of 22.97% reflecting a *forward-looking* estimate of expenses and overheads using the MCI/Hatfield methodology.[89]

The selection of a cost factor clearly has a material impact on the aggregate estimate of the costs of providing universal service:

- For the national results (without ETI corrections), the model yields an average monthly cost of $23.04 if the embedded cost factor is used and yields an average monthly cost of $16.71 if the forward-looking cost factor is used.[90] Also, assuming a price threshold of $30, if the embedded cost factor is used, the BCM computes a national USF requirement of approximately $4.9-billion, whereas when the forward-looking cost factor is applied, the BCM computes a national USF

89. Joint Submission, at II-1.

90. *Id.*, at II-2.

requirement of approximately $2.2-billion. The model documentation fails to provide details of the calculation of the two different cost factors.[91]

Given the importance of this variable, the Joint Sponsors should be encouraged to provide detailed documentation and justification of their respective computations.

What the model should do

The cost factor that is based strictly upon ARMIS reports of embedded expense levels — without any apparent modifications — should be rejected for several reasons, which are discussed below and in Appendix 4A. We have taken preliminary steps to develop an alternative to the ARMIS-based cost factor by examining the data in Table 2.9 in the FCC's *Statistics of Common Carriers*[92] for all reporting local exchange carriers.[93] These data include total cost figures (i.e., they include "nonregulated" items and are thus slightly in excess of the amount subject to separations). In Appendix 4A, we revised figures in certain expense accounts to more accurately reflect expenses associated with the provision of universal service, however, even these figures should be considered as upper bounds in determining which expenses are appropriately associated with the provision of basic local exchange service.[94] We also examined the six-volume *Cost of Service Study* (COSS) submitted by NYNEX to the Massachusetts Department of Public Utilities for the 12 months ending November 1992 for more detailed descriptions of the accounts and for data regarding the distribution by NYNEX of the expenses among subcategories of individual accounts, and between residence and business classes. For example, an analysis of the Massachusetts COSS narrative and data for Account 6611 (Product Management) reveals that 84% of the expenses in this account support market management and planning for business customers and, indeed, only 5.3% percent of the expenses in the account support residence services.

91. *Id.*, at IV-28.

92. This table is based upon the Automated Reporting Management Information System (ARMIS) Reports (FCC Report 43-02). Table 2.12 is based upon ARMIS Reports 43-01, however, Report 43.01 lacks the detail provided in Report 43-02.

93. See Appendix 4B for the list of reporting (i.e., Tier I) local exchange carriers.

94. ETI's examination is intended to highlight some key areas that merit scrutiny, but does not represent a complete examination of all accounts. The purpose of the ETI analysis is to expose some illustrative fundamental flaws with the ARMIS-based approach. The analysis below represents an upper bound for an estimate of the expenses because, in some instances, it reflects all types of residence activities, not just basic local exchange service.

Table 4.1 below, summarizes some of the relevant accounting data from the *Statistics of Common Carriers*.

Table 4.1

Selected Data for Tier I LECs
(1994)
(000s Omitted)

Account	Amount
TPIS	$267,443,392
Total Plant	$272,474,927
Total Depreciation and Amortization	$115,703,078
Net Plant	$156,771,851
Total Operating Revenues	$ 92,927,905
Total Operating Expenses	$ 70,263,301
Depreciation Expenses	$18,655,947
Net Operating Revenues	$ 22,664,599

Source: *SOCC*, 1994/1995 Edition, Table 2.9, Column 3

Historical depreciation expenses reflect estimated lives that are not indicative of the lives of plant necessary to offer basic telephone service

Depreciation expenses account for approximately 27% of the LECs' total operating expenses and thus should be examined most critically. The digital switches, distribution, and feeder that are of all the LEC expenses, necessary for basic telephone service need not be replaced for at least 20 years and thus depreciation expenses should be less than the historical depreciation expenses reflected in the ARMIS reports. Depreciation expenses during the last decade reflect a time period when local exchange carriers accelerated their depreciation of analog switches for diverse reasons, many of which are unrelated to the ongoing provision of the primary residential access line. Although local exchange carriers have sought to portray modernization plans as "business-as-usual," in fact the plans have typically caused the premature retirement of telecommunications plant that is/was in all other respects adequate and efficient to satisfy the needs of primary residential access line subscribers. The acceleration in the replacement of existing plant results in retirements in advance of the originally anticipated mortality curve. This, in turn, impacts depreciation expenses in several ways, including the creation of reserve deficiencies and a rationale for increases in the depreciation rates for the affected plant categories. Moreover, the acquisition of new plant creates additional depreciations charges; to the extent that those acquisitions/replacements were not economically justified on their own merit (in terms of incremental revenues and avoided costs), upward pressure is placed upon embedded cost levels overall.

For example, in 1993, Southern New England Telephone Company (SNET), in a revenue requirement investigation, sought to increase depreciation rates for its analog switch account from 7.8% to 7.9% and for its digital switch account from 5.0% to 7.2%.[95] Under the embedded cost approach, such increases in depreciation charges on embedded plant (whether of a current or older generation) are being attributed to universal service, although there is no specific linkage between the plant replacement decision and the plant actually required to supply primary residential access line service. The use of embedded cost factors is fundamentally at odds with the TSLRIC concept, and has the effect of transforming what is facially offered as an "incremental cost" study into an historical embedded cost analysis. Once efficient technology is assumed for the provision of basic telephone service, there is simply no reason to incorporate into the model an expectation that such equipment will be prematurely retired *unless such an expectation was itself incorporated into the capital budgeting decision upon which the LEC relied in justifying the plant replacement in the first place.*[96] Lives of at least 20 years should be assumed.[97]

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95. Connecticut DPUC Docket No. 92-09-19, *Application of the Southern New England Telephone Company to Amend its Rates and Rate Structure,* SNET Response to OCC-595 ("SNET Response to OCC-595"). The prescribed depreciation rates for SNET's digital switch account in 1987 and 1990 were 4.9 and 5.0, respectively. *Id.*.

96. A critical parameter in a discounted cash floor (DCF) type of capital investment analysis is the revenue-producing life of the asset under examination. All other things being equal, the more years that the asset is expected to remain in revenue-producing service, the higher will be its net present value (NPV). If the life of an asset is shortened after the decision to acquire it has been made, the asset may well become non-performing (in the financial sense) on the basis of its newly reduced life expectancy. That is, had the revised life been used in the original DCF analysis, the NPV may well have turned out to be negative, indicating that the investment should not be pursued. The financial consequences of this type of revisionism of previously-made management decisions properly belong to the LEC's management and shareholders, and not to its customers. Of course, by utilizing *embedded* cost factors, the economic loss is imposed entirely upon customers and, in the instant case, upon universal service in particular. It is also worth observing that (in the context of incentive regulation), were the initial life expectancy to prove unduly *pessimistic*, shareholders, not customers, would enjoy the financial gains arising from the *longer* actual service life that would then ensue.

97. See, for example, SNET Depreciation Study for 1993, Account 2212. A life span of 19 years is estimated for six of the ten DMS 100 and DMS 100/200 switches and a life span of 15 years is estimated for the other four switches.